

Study of Tuberculosis Through Epidemiological Approach

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Abstract: Tuberculosis is a contagious disease known as child of poverty, disease rate is increasing globally and people have no awareness about its risk factors so this study aims to identify risk factor associated with tuberculosis by using epidemiological approaches in order to overcome this disease. Blood sample of tuberculosis patients were collected from D.H.Q hospital Sargodha. Health status, life style habit informations were collected along with physical examination of each patients. The high ratio of tuberculosis infection was found in male (52.1%). Age group of 16-25 year have greater incidence (37.5%) of tuberculosis. 75.7% patients have poor diet. Incidence of tuberculosis was high (53.7%) in those individuals whose BMI was =18.5 and were categorized as underweight. 77.1% individuals who had disease remained in close contact with tuberculosis patients before onset of disease Compared with normal group WBCs, LYM, Mono, MCH and MCHC was higher in tuberculosis patients while RBCs, Neut, PLTs, Hbg, PCV and MCV were lower in tuberculosis patients. Poor diet, previous close contact with tuberculosis patients and low BMI were independent risk factors among Mycobacterium infected subjects. The present study also revealed alteration in the level of hematological parameter.

Key words: Tuberculosis • Mycobacterium • D.H.Q hospital • WBCs • LYM • Mono • MCH • Mycobacterium

INTRODUCTION

Tuberculosis is a contagious disease and usually it affects the lungs, 8.8 million people develop active tuberculosis every year and about 1.6 million people die every year due to this disease. Bacteria that is responsible for tuberculosis is *Mycobacterium tuberculosis*. When patients of tuberculosis sneeze or cough these bacteria spread through the air. Because the human immune system usually contains the infection that's why one third of the world population is actually infected with *M. tuberculosis*. People, who are infected mostly with *Mycobacterium tuberculosis*, become ill not at all. Within the body of these people the bacteria is in dormant form, if host immunity decreased because of increasing age or because of other medical conditions such as HIV then it can cause disease [1].

Tuberculosis is the child of poverty which facilitates the transmission of Mycobacterium tuberculosis in three ways, primarily by influencing living conditions, such as people living in poorly ventilated and overcrowded

homes, secondly prolonged diagnostic delay and thirdly due to malnutrition and/or HIV infection increased vulnerability of tuberculosis. [2][3].

Development of a disease is a three-stage process, first infection then progression and later develops the disease, depending upon various risk factors. Several sociological and epidemiological approaches aims to identify risk factors associated with tuberculosis infection, progression and development, in order to decrease the risk of tuberculosis at individual level [4].

Many risk factors are associated with infection, progression and serious outcome of disease. Some of the risk factors for infection include close contact to a patient with infectious TB, such as living in smaller houses, overpopulated houses and same the homelessness, prisoners and certain occupations [5].

Continuously advancing of disease is facilitating by co-diseases, such as HIV or AIDS, silicosis or diabetes as well as by poor nutrition [6]. The major cause of mortality in Individuals infected with HIV is TB [7].

Close contact strategy is important risk factor in transmission of tuberculosis. The rate of transmission of TB in contacts is higher than other similar studies and its transmission can be interrupted by earlier detection and treatment of adults is a step towards eliminating childhood TB [8]. Risk of developing tuberculosis is greater especially in children, adolescents, young adults when they are infected with *Mycobacterium tuberculosis*, and also close contact of person with tuberculosis patients [9].

Diabetes is a not only a strong risk factor for pulmonary TB but also have negative impact on treatment [10]. TB patients with diabetes have higher mortality rate as compared with patients without diabetes, particularly in the first month of treatment [11]. Type 2 diabetes patients have more susceptibility to tuberculosis because of their altered immune response [12].

Tuberculosis and HIV have also strong association therefore, it is important to consider that the possibility of the prevalence of HIV may also be increasing, in areas where there are high TB case notification rates [13]. TB is most frequent in HIV infected patients [14]. Tuberculosis patient with HIV infection is related with an enhanced risk of AIDS and death. TB induces prolonged immune activation and leads to prolonged increased HIV replication and accelerated disease progression [15].

Between TB incidence and BMI there is a strong and consistent relationship [16]. People with human immunodeficiency virus have low body mass index (BMI) which is a known risk factor for tuberculosis (TB). [17] Risk of both mortality and TB is significantly reduced in HIV-infected individuals with obese and overweight BMI [18].

There is a close correlation between severity of tuberculosis and the hematological abnormalities. Hematological abnormalities are common in tuberculosis. It seems that for the severity of the tuberculosis, weight of body loss, hemoglobin level and white blood cell count are useful indices. To control disease, return back of these parameters to a normal level is a good indication [19].

The rate of TB is high in males than females and mostly affected the age groups ranged from 21 and 30 years. The most affected age group was between 21 and 30 years. The ratio of male to female in patients with tuberculosis is 2:1.while a great proportion (65–68%) of patients are young and belong to reproductive age group. [20]

Tuberculosis is spreading day by day in district Sargodha and people have no awareness about its risk factors so, the purpose of this study is to identify the risk factors associated with TB using epidemiological approaches in order to overcome this disease.

MATERIAL AND METHODS

For this purpose two groups were made. One was consisting of tuberculosis patients and second was control. Blood samples of tuberculosis patients (male, female and children) were collected from D.H.Q hospital Sargodha. From each participant sampling was conducted along with interview. Information related to Diet, close contact with TB person, any other disease associated with tuberculosis and other information related to their life style. BMI was also calculated after interviewing. Same information was collected from control group. In hematological parameters hemoglobin concentration was determined by using spectrophotometer. Hemocytometer was used to count the number of RBCs, WBCs and platelets. Differential leukocytes, PCV, MCV, MCH, MCHC were also calculated.

RESULTS

The high ratio of tuberculosis infection was found in male (52.1%) as compared to female which was 47.9% (Fig. 1).

Age group of 16-25 year have greater incidence (37.5%) of tuberculosis as compared to other age group which was 5-15 year (12.5%), 26-35 (11.5%), 36-45 (17.7%), 46-55 (17.3%), 56-65 (8.3%) and 66-75 (5.2%) (Fig. 2).

There was significant association of dietary habits with Tuberculosis as 75.7% patients were having poor diet (Fig. 3).

Incidence of tuberculosis was high (53.7%) in those individuals whose BMI was ≤ 18.5 and were categorized as underweight while 1% individuals categorized as obese (BMI=30) (Fig. 4).

77.1% individuals belong to those people who remain in close contact with tuberculosis patients in past due to smaller houses (Fig. 5).

When T-test was applied for hematological parameters, WBC, Neut, LYM, Mono, MCV, MCH shows non significant ($p > 0.05$) results while PLTs, Hbg and PCV shows highly significant ($p < 0.05$) results.

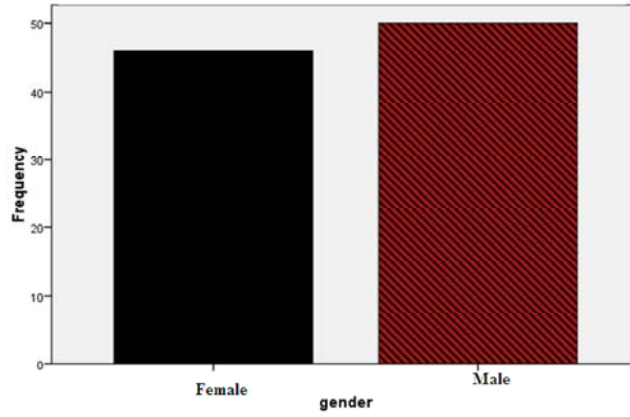


Fig. 1:

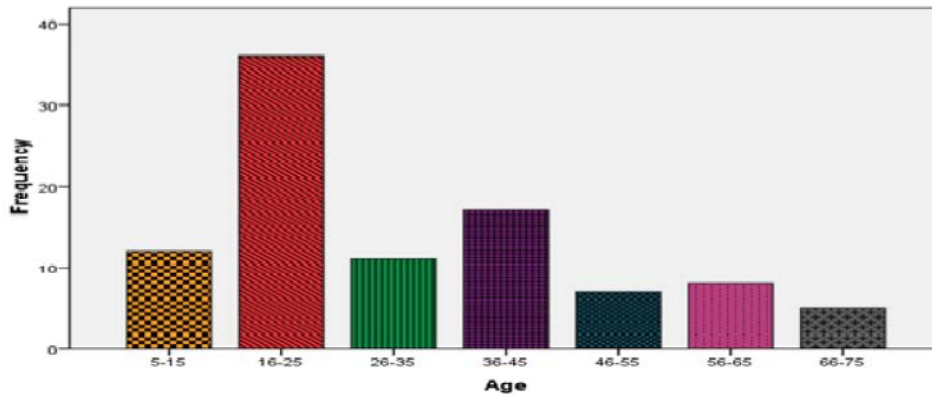


Fig. 2:

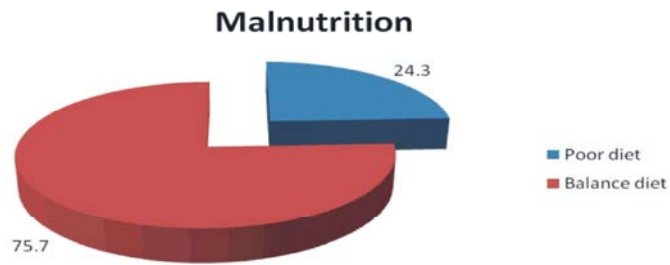


Fig. 3:

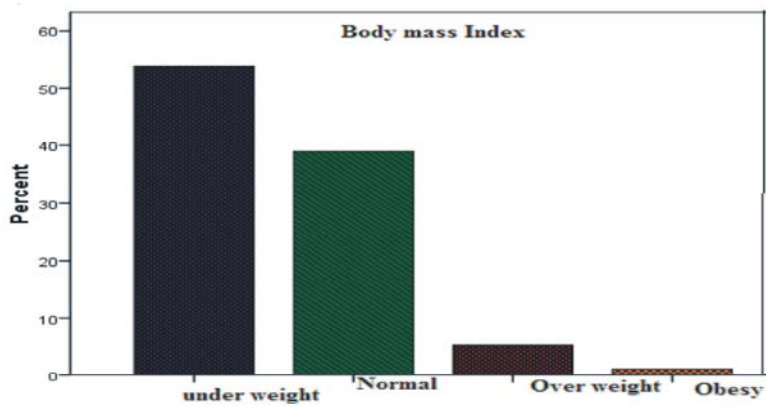


Fig. 4:

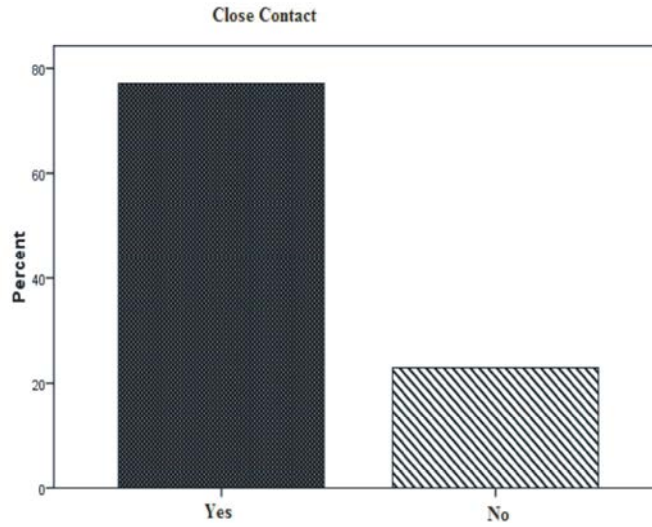


Fig. 5:

Table 1: Comparison of hematological parameters between tuberculosis patients and normal group

| Sr No | Hematological parameters among Groups | Mean | SD | SE | t- value | PrOb. |
|-------|---------------------------------------|--------|-----------|----------|----------|----------------------|
| 1 | RBC | | | | | |
| | Tuberculosis | 3.750 | 0.674 | 0.068 | | |
| | Normal | 4.437 | 0.523 | 0.0872 | -5.518 | 0.000 |
| 2 | WBC | | | | | |
| | Tuberculosis | 6560 | 2071.210 | 210.299 | | |
| | Normal | 6280 | 2406.295 | 401.049 | 0.662 | 0.539 ^{NS} |
| 3 | Neut | | | | | |
| | Tuberculosis | 62.260 | 8.183 | 0.830 | | |
| | Normal | 63.219 | 7.117 | 1.186 | -0.621 | 0.536 ^{NS} |
| 4 | LYM | | | | | |
| | Tuberculosis | 31.885 | 9.868 | 1.002 | | |
| | Normal | 31.019 | 8.851 | 1.475 | 0.461 | 0.8650 ^{NS} |
| 5 | Mono | | | | | |
| | Tuberculosis | 4.921 | 3.418 | 0.347 | | |
| | Normal | 4.675 | 1.240 | 0.206 | 0.610 | 0.695 ^{NS} |
| 6 | PLTs | | | | | |
| | Tuberculosis | 225110 | 88024.030 | 8937.486 | | |
| | Normal | 255560 | 58919.530 | 9819.921 | -2.293 | 0.05* |
| 7 | Hbg | | | | | |
| | Tuberculosis | 10.128 | 1.686 | 0.171 | | |
| | Normal | 11.811 | 1.648 | 0.274 | -5.197 | 0.000** |
| 8 | PCv | | | | | |
| | Tuberculosis | 31.592 | 6.091 | 0.618 | | |
| | Normal | 39.641 | 4.402 | 0.733 | -8.388 | 0.000** |
| 9 | MCV | | | | | |
| | Tuberculosis | 83.082 | 10.447 | 1.060 | | |
| | Normal | 86.983 | 15.107 | 2.517 | -1.683 | 0.75 ^{NS} |
| 10 | MCH | | | | | |
| | Tuberculosis | 27.456 | 4.226 | 0.429 | | |
| | Normal | 26.608 | 2.171 | 0.361 | 1.511 | 0.1 ^{NS} |
| 11 | MCHC | | | | | |
| | Tuberculosis | 32.440 | 4.260 | 0.432 | | |
| | Normal | 28.966 | 4.607 | 0.767 | 4.087 | 0.000* |

Compared with normal group WBCs, LYM, Mono, MCH and MCHC with mean level 6560, 31.885, 4.921, 27.456 and 32.440 respectively was higher in tuberculosis patients while RBCs, Neut, PLTs, Hbg, PCV and MCV were lower in tuberculosis patients.

DISCUSSION

The present study was carried out to identify the risk factors associated with tuberculosis using epidemiological approach. Environment interacts with host-related factors and contributing to the overall phenotype so tuberculosis is a multifactorial disorder. Individual Susceptibility to *Mycobacterium tuberculosis* is influenced by many factors. To reduce the risk of disease at the individual level the epidemiologic approach aims to identify risk factors for infection/disease (either biological, or environmental).

Epidemiological factors include age, gender, previous close contact and BMI contributed to increase the burden of tuberculosis infection. Tuberculosis was more common among the age group of 16-25 and than in 36-45 [20]. whose findings were that the most infected individuals belong to age group of 21-30 year. Males were more susceptible to mycobacterium tuberculosis allegorized to females [20]. incidence of tuberculosis was high in male as compared to female.

Close contact appeared as major risk factor that contributed to the infection in 71.1% cases. [21] high risk of developing tuberculosis in persons having close contact with tuberculosis patients. Due to smaller houses mycobacterium tuberculosis spread even through breathing. Malnutrition was another important risk factor associated with tuberculosis. About 75.7 % tuberculosis patients have poor diet. In tuberculosis patients the nutritional level was very low which increase the risk of tuberculosis infection [22].

Many study were carried out that there is close correlation between tuberculosis and hematological parameters [23]. Heamoglobin concentration, Pack cell volume, mean cell heamoglobin(MCH) of tuberculosis patients (10.128±1.686 g/dl, 31.592±6.091%,27.456±4.226 pg) were significantly lesser in tuberculosis patients as compared to normal group [24]. Mean cell volume was 83.082±10.447fl in tuberculosis patients while in normal group it was higher (86.983±15.107fl).

Platelets count (225110±88024.030 mm³) was lower in tuberculosis patients as compared to normal [25]. Most of the tuberculosis patients had anemia because they had lower level of RBCs as compared to normal due which

their heamoglobin level was also decreased [26]. The number of lymphocytes in tuberculosis patients were decreased as compared to normal [27].

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